

DESCRIPTION

METHOD OF SETTING AUDIO OUTPUT LEVEL
AND DEVICE THEREFOR

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TECHNICAL FIELD

The present invention relates to a method of setting the audio output level for a device equipped with audio output.

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BACKGROUND ART

Currently, setting of the audio output level for a device equipped with audio output, such as a television set or audio equipment, is generally made through remote control with a remote control unit, as well as through setting with the main unit of the device. Therefore, 15 the main unit and remote control unit have buttons for the volume level up/down respectively being allocated, where these volume change buttons are operated as required when using a television set or audio equipment. A volume adjustment button is usually easy to operate because it is frequently used.

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Meanwhile, a television set or audio equipment usually has its volume range from an adequately large volume as compared to one in regular use, to silence. The maximum available volume of the device is not necessarily equal to an allowable level in regular use.

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Among conventional methods of setting the audio output level, a method of automatically adjusting the volume level according to ambient circumstances is disclosed in Japanese Patent Unexamined Publication No. H08-97654 (hereinafter, referred to as "patent

literature 1"). Further, a method in which minimum and maximum input levels are preliminarily set when amplifying audio signals with a variable gain amplifier, is disclosed in Japanese Patent Unexamined Publication No. H10-294990 (hereinafter, referred to as "patent literature 2").

As mentioned above, the operation of changing the volume setting for a television set or audio equipment is desirably easy because the operation is frequently performed. This instead may cause the volume level to increase more than necessary if the operable part is accidentally touched or if an infant innocently changes the volume level.

Even if the volume level is automatically changed according to ambient circumstances as in the invention described in patent literature 1, the above-mentioned problems can not be solved because the basic audio level is set by the user.

Meanwhile, a maximum output volume may be restricted as in the invention described in patent literature 2, which is obstacle because a required volume level may not be available in some operation environments.

Further, in a television set or audio equipment, turning on the power again after turning off with the volume level remaining at a high setting, causes too large a sound to burst out from the device because the previous audio output level is retained.

Another problem is, if the audio output level has been changed while the device is in a silent state for its controlling, releasing the silent state unexpectedly causes too large a sound to burst out from the device.

SUMMERY OF THE INVENTION

In order to solve these problems, with a method of setting the audio output level for a device equipped with audio output, according 5 to the present invention, a range of the audio output level in regular use is set as a threshold; if an operation is made for setting the audio output level that exceeds the range of the audio output level having been set, a request is made for an acknowledgment that the operation of changing the audio output level is appropriate; and only if a reply is 10 given, the setting is changed.

Further, a method of setting the audio output level according to the present invention is characterized in that the initial audio output level is automatically changed when next used, if the audio output level has been set when previously used so that the audio output level 15 exceeds the range of the audio output level in regular use.

Still, in a method of setting the audio output level according to the present invention, in a device that receives signals including audio information and performs audio output according to the receive signals, the reception state of the receive signals is checked; if the operation of 20 changing the audio output level setting is made during a silent period according to the reception state, the audio output level setting is not changed, but notice that the audio output level setting is not to be changed is given. Alternatively, a request is made for an acknowledgment that the audio output level setting is to be changed, 25 and only if such an acknowledgment is given, the setting is changed.

With the above-mentioned method, requesting the operator for an acknowledgment that the operation of changing the volume level

currently being performed is one intended by the operator solves the problem in which an operating error causes audio output larger than necessary. Meanwhile, if the audio output level exceeding the range of the audio output level in regular use is selected for some reason, the 5 problem is solved in which the retained audio output level setting causes audio output larger than necessary when the device is used again or the audio output is resumed.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is a block diagram showing the makeup of an device for setting the audio output level according to the first exemplary embodiment of the present invention.

Fig. 2 is a flowchart showing a method of setting the audio output level according to the first exemplary embodiment of the present 15 invention.

Fig. 3 is a block diagram showing the makeup of an device for setting the audio output level according to the second exemplary embodiment of the present invention.

Fig. 4 is a flowchart showing a method of setting the audio output 20 level according to the second exemplary embodiment of the present invention.

Fig. 5 is a block diagram showing the makeup of an device for setting the audio output level according to the third exemplary embodiment of the present invention.

25 Fig. 6 is a flowchart showing a method of setting the audio output level according to the third exemplary embodiment of the present invention.

Fig. 7 is another flowchart showing a method of setting the audio output level according to the third exemplary embodiment of the present invention.

5 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

A description will be made for a method of setting the audio output level according to exemplary embodiments of the present invention, using drawings.

10 FIRST EXEMPLARY EMBODYMENT

First, a description will be made for an example makeup of devices realizing the method of setting the audio output level according to the present invention. Here, in this application, the audio output level is assumed to refer to the degree of volume amplification output from an 15 actual speaker or the like for audio signals.

Fig. 1 is a block diagram showing an example makeup according to the exemplary embodiment of the present invention. In Fig. 1, the device for setting the audio output level according to the present invention has volume adjuster 1, volume setting means 2, output level monitor 3, audio output level memory 4, replying means 5, volume changing means 6, and audio output means 7.

Here, audio output level memory 4 stores a threshold in setting a range of the audio output level, where the threshold is preliminarily set by the user. Hereinafter, a description will be made for a case 25 where an upper limit of the audio output level is set as this threshold.

Volume adjuster 1, used for inputting a volume adjusting command, corresponds to a volume change button on the remote control unit, a

button or knob for setting the volume level provided on the main unit. Volume adjuster 1 gives notice to volume setting means 2 that a request has been made for changing the audio output level setting (up or down of the volume level).

5 Volume setting means 2 receives from volume adjuster 1 a request for changing the audio output level setting. Volume setting means 2 then gives notice to volume changing means 6 of changing the audio output level, if the request made from the volume adjuster 1 for changing the audio output level setting is for the volume level down, or
10 if the changed audio output level is lower than the upper limit of the audio output level that has been preliminarily set. Next, volume setting means 2 gives notice of changing the audio output level to volume changing means 6, if an acknowledgement is given by replying means 5 that the change is appropriate.

15 Meanwhile, if the request for volume setting made from the volume adjuster 1 is for the volume level up, volume setting means 2 judges whether the changed audio output level exceeds the upper limit of the audio output level preliminarily set. This upper limit of the audio output level, stored in audio output level memory 4, may be
20 changeable according to an operator's instruction, or may be a fixed value preliminarily set.

25 If the changed audio output level exceeds the upper limit of the audio output level preliminarily set, volume setting means 2 then gives notice to output level monitor 3 that a request has been made for changing to the audio output level exceeding the upper limit.

Output level monitor 3 gives notice to the operator who has made the volume adjustment that the audio output level is to exceed the

upper limit preliminarily set after the audio output level setting is changed. The notice can be given with characters on the screen of a device provided with a display unit such as a television set, and/or with sound.

5 Replying means 5 receives a reply from the operator that the volume adjustment is appropriate, when the output level monitor requests the operator for an acknowledgement that the audio output level setting is appropriate. Replying means 5 corresponds to a button provided on the remote control unit or main unit, in the same 10 way as in volume adjuster 1. Here, separately providing a reply button may be avoided by adding the function of a reply button to another operation button. In this case, the relevant operation button is usually used for selecting its original function individually allocated. However, the button works as a reply button for output level monitor 3 15 for a certain period of time immediately after a request for an acknowledgement is made by output level monitor 3. A certain period of time may be 3 seconds, for example. Here, if a reply is given from replying means 5, output level monitor 3 may give notice again to the operator that setting the audio output level has been enabled, to 20 encourage the operator to change the audio output level.

Volume changing means 6 changes the audio output level according to an instruction for changing the audio output level setting given by volume setting means 2. Changing the audio output level is feasible with an electronic volume control device, for example.

25 Audio output means 7 outputs audio signals with their audio output level set by volume changing means 6.

Next, a description will be made for the detailed processing

procedure by volume setting means 2, using the flowchart in Fig. 2.

First, the process accepts an instruction for volume adjustment from volume adjuster 1 (step 102). Next, the process distinguishes the type of instruction for volume adjustment (step 103).

5 If the instruction is for the volume level up, the process judges whether or not the volume level set by the instruction for volume adjustment exceeds the upper limit of the audio output level preliminarily set (step 104). Meanwhile, if it is for the volume level down, the process decreases the audio output level and then ends the
10 volume adjustment (steps 111 and 112). In step 104, if the audio output level set with the instruction for volume adjustment does not exceed the upper limit, the process increases the audio output level and then ends the volume adjustment (steps 110 and 112).

In step 104, in case the audio output level set with the instruction
15 for volume adjustment exceeds the upper limit, the process requests the operator for an acknowledgement that the operation is appropriate (step 105).

When a reply is given from the operator within a certain period of time, the process increases the audio output level according to a
20 subsequent instruction for the volume level up, and then ends the volume adjustment (steps 106, 107, 108, and 112).

In step 106, if a reply is not given from the operator within a certain period of time, the process sets the audio output level to the upper limit and then ends the volume adjustment (steps 109 and 112).
25 As a replying means from the operator, another operating means on the device can be used instead within a certain period of time after the request for an acknowledgement, not necessarily requiring a separate

operating means.

In the above-mentioned makeup, the description is made for a method of setting the audio output level using one threshold.

However, plural thresholds can be set and stored. For example, the 5 upper limit of the audio output level may be separately set according to a time frame in using the device. As an example, two different thresholds for daytime and nighttime are to be set, where the upper limit for daytime is to be different from that for nighttime.

In this case, it is adequate as long as these thresholds are set and 10 stored being associated with the clock time information using its threshold. As a result, comparing the current clock time information obtained from the built-in clock means, with the stored clock time information, allows the audio output level to be controlled using the threshold having been set for the present time. Daytime may be set as 15 from 6:00 a.m. to 8:00 p.m.; nighttime from 8:00 p.m. to 6:00 a.m., for example, thus enabling fine-tuned control of the audio output level according to the user's life pattern, such as a relatively large threshold for daytime and small for nighttime.

Naturally, setting three or more thresholds and more minute clock 20 time information to be associated allow further finer-tuned control of the audio output level.

The upper limit of the audio output level may be changeable according to a connected device. For different signal levels by device, such as audio equipment with various devices connected, the upper 25 limit of the audio output level may be separately set by device.

In this case, it is adequate as long as these thresholds are set and stored being associated with the information for the audio output

device using its threshold. As a result, comparing the information about which audio output device is currently outputting, with its ID number, which is allocated for identifying the device, assuming that the target equipment using the present invention incorporates plural audio output devices such as a CD player and radio receiver, allows the audio output level to be controlled using the optimum threshold for the device.

Allocating a relevant ID number also to the audio input terminal allows the audio output level to be controlled as well, even if an external audio output device is connected.

In the above description, the upper limit of the audio output level is to be preliminarily set. However, the lower limit can be preliminarily set as well. In this case, if setting is made so that the value is lower than the lower limit when decreasing the volume level, it is adequate as long as a request is made to the operator for an acknowledgement that the operation is appropriate, and if a reply is given, setting is made so that the value is lower than the lower limit.

As described above, the method of setting the audio output level and the device for setting the audio output level according to the present invention allow preventing an error in setting the audio output level due to an operating error, by making a request for an acknowledgement that the volume adjustment currently intended is appropriate.

25 **SECOND EXEMPLARY EMBODIMENT**

A description will be made for a method of setting the audio output level according to a second exemplary embodiment of the present

invention, using Fig. 3. Fig. 3 shows operation state judging means 8 newly added to Fig. 1. Accordingly, a detailed description is omitted for a part with a makeup same as that in Fig. 1.

The second exemplary embodiment is different from the first one 5 in that signals from operation state judging means 8 are connected to volume setting means 2. In the first exemplary embodiment, setting the volume output by the device is made according to an operation instruction from volume adjuster 1.

Meanwhile, in the second exemplary embodiment, the volume level 10 is set according to instructions from operation state judging means 8, in addition to those from volume adjuster 1.

In Fig. 3, operation state judging means 8 gives notice to volume setting means 2 that it is immediately after the power is turned on. A description is made for the actions of volume setting means 2 using the 15 flowchart in Fig. 4.

Volume setting means 2 identifies a state immediately after the power is turned on, by detecting signals from operation state judging means 8 (step 202).

Volume setting means 2 checks the audio output level setting when 20 the power is turned on, and ends setting of the audio output level if it is lower than the upper limit of the audio output level preliminarily set (steps 203 and 205).

Meanwhile, volume setting means 2 changes the audio output level, and then ends setting of the audio output level if it exceeds the upper 25 limit thereof preliminarily set (steps 203, 204, and 205).

The changed audio output level may be the upper limit of the audio output level or a separate one preliminarily set.

When audio signals are output being selected among plural kinds, the output level can be separately set by kind of signals at a connection source. Here, plural kinds of audio signals refer to audio signals such as those from a radio receiver and compact disc player, for audio equipment; and those from satellite and terrestrial broadcasting, and from video equipment, for television.

Meanwhile, in the above description, operation state judging means 8 is to give notice to volume setting means 2 that it is immediately after the power is turned on. However, operation state 10 judging means 8 may give notice to volume setting means 2 that the power has been turned on only when the power is cycled after a certain period of time. Here, a certain period of time is to be 15 to 30 minutes or longer, for example. This makeup prevents the volume level setting made immediately before from being changed if the power is frequently 15 cycled, dispensing with resetting the volume level every time the power is turned on despite a slight change in operation environment of the device.

As a concrete example for operation state judging means 8, the case is shown where judgement is made that it is immediately after the 20 power is turned on. However, besides detecting a state in which the power is turned on and off, detecting may be made that no operation has been performed for a certain period of time. Alternatively, judgement may be performed whether the elapsed time from the last 25 audio output to the new one exceeds a certain period of time. This makeup may be applied to a cell phone, for example, where continuous audio output is not necessarily made while the power is on.

Here, a telephone call on a cell phone is taken as an example.

When the audio signal output level is set so as to exceed the upper limit of the audio output level preliminarily set, for some reason in the previous telephone call, the audio signal level may be reset to the audio output level preliminarily set in the next call. This prevents sound 5 with a volume level higher than necessary from being unexpectedly output in an environment for the next call, due to a change from the previous call in ambient environment.

Hereinbefore, the description is mainly made for the case where the audio output level is increased. However, it is obvious that the 10 same method can be applied for the case where the audio output level is decreased, inversely.

When upper and lower limits are set of the audio output level suitable in an ordinary environment, and if the audio output level exceeds the upper or lower limit, the method in the description 15 hereinbefore can be applied.

In this exemplary embodiment, setting and storing plural thresholds with information about time and the audio output device to be associated, allow further finer-tuned control of the audio output level.

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THIRD EXEMPLARY EMBODYMENT

A description will be made for a method of setting the audio output level according to a third exemplary embodiment of the present invention, using Fig. 5. Fig. 5 shows reception state judging means 9 and receiver 10 newly added to Fig. 1. Accordingly, a detailed 25 description is omitted for a part with a makeup same as that in Fig. 1.

The third exemplary embodiment is different from the first one in

that signals from reception state judging means 9 are connected to volume setting means 2, and that signals from receiver 10 are connected to reception state judging means 9. In the first exemplary embodiment, setting the volume output by the device is made according 5 to operation instructions from volume adjuster 1.

The third exemplary embodiment relates to a method of setting the audio output level when a volume adjustment is made in a device equipped with an audio output function, such as a television set or audio equipment, particularly assuming that the audio output level is 10 changed according to reception conditions in broadcasting.

Accordingly, in the third exemplary embodiment, volume setting means 2 sets the volume level according to instructions from reception state judging means 9 in addition to those from volume adjuster 1. Reception state judging means 9 gives instructions to volume setting 15 means 2 according to information from receiver 10.

Hereinafter, a description of this exemplary embodiment will be made for a case where TV broadcasting is being viewed on a mobile object such as an automobile. When receiving TV broadcasting on a mobile object, reception conditions largely change with its movement. 20 Poor reception conditions cause interruption in sound and image. When receiving digital broadcasting in particular, interruption in sound and image occurs if the receive signal quality decreases below a certain level. In this case, such control is usually performed that an image having been received until immediately before is output as a 25 still image and audio output is not made. Here, when receiving the conventional analog broadcasting, where degradation in sound and image gradually emerges according to degradation in receive signal

quality, viewers can recognize degradation in reception quality relatively easily.

As mentioned above, when receiving digital broadcasting, a still image and silence may mislead a viewer into believing that the silence 5 is caused by the low audio output level and into trying to increase the volume level.

Under the circumstances, receiver 10 shown in Fig. 4 gives notice of the reception state of broadcasting to reception state judging means 9. Reception state judging means 9 detects signals from receiver 10 10 and then gives notice of the reception state to volume setting means 2.

A description will be made for the actions of volume setting means 2, using Fig. 6. Volume setting means 2 detects that a request has been made for changing the audio output level (step 302). Volume setting means 2 detects signals from reception state judging means 9 to 15 check the current reception conditions (step 303). If the broadcast is being normally received, the process changes the audio output level (step 304), and then ends setting of the audio output level (step 306).

Meanwhile, if the broadcast is not normally being received, the process gives notice that the audio output level will not be changed 20 (step 305), and then ends setting of the audio output level (step 306).

Here, the notice that the audio output level will not be changed may be given with characters on the screen of a display unit or with sound.

This method solves the following problem. That is, if the audio 25 output level has been changed while the device is in a silent state for its controlling, releasing the silent state causes too large a sound to burst out from the device.

The actions of volume setting means 2 can be also the processes in Fig. 7. Volume setting means 2 detects a request for changing the audio output level having been made (step 402). Volume setting means 2 detects signals from reception state judging means 9 to check 5 the current reception conditions (step 403). If the broadcast is normally being received, the process changes the audio output level (step 404), and then ends setting of the audio output level (step 407).

Meanwhile, if the broadcast is not normally being received, the process makes a request for an acknowledgement that the operation for 10 changing the audio output level is appropriate (step 405), and if the operator selects continuing of the change operation, the process changes the audio output level (step 404), and then ends setting of the audio output level (step 407).

Meanwhile, in step 405, if the operator does not select continuing 15 of the change operation, the process gives notice of discontinuing the level change (step 406), and then ends setting of the audio output level (step 407).

The method of giving notice that the audio output level will not be changed is to be the same as that in Fig. 6. The notice of 20 discontinuing the change of the audio output level in step 406 can be omitted.

The above method solves the following problem. That is, if the audio output level has been changed while the device is in a silent state for its controlling, releasing the silent state unexpectedly causes too 25 large a sound to burst out from the device.

Here, the description is made for the case where digital TV broadcasting is received on a mobile object as the third exemplary

embodiment. However, this exemplary embodiment can be applied to another type of usage. Further, the first exemplary embodiment can be combined with the second one.

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INDUSTRIAL APPLICABILITY

A method of setting the audio output level and a device for setting the audio output level of the present invention eliminate an error in setting the audio output level due to an operating error, and prevent sound with an inappropriate volume level from being output when the 10 device is used next time or when the reception state becomes improved, which is useful for devices with an audio output function in general.